New Source MACT
for
Reciprocating Internal Combustion Engines

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INTRODUCTION

To the knowledge of the Reciprocating Internal Combustion Engine (RICE) Work Group (WG), Hazardous Air Pollutants (HAPs) emitted by stationary RICE has rarely been regulated by any agency. If there are any requirements they are limited to a small number of pollutants. Engine manufacturers have very limited data on HAPs and it is not known which HAPs are emitted or at what levels. Formation mechanisms of HAPs in RICE are poorly understood and there is no reliable information on techniques that could be used for reducing HAPs. During the ICCR process various types of catalysts were discussed and identified as a method that, theoretically, could be used for reducing HAPs. There is currently little information on the interface between catalysts and stationary engines for reducing HAPs and uncertainty about whether catalytic activity might actually increase emissions of some HAPs . There is little information available on other technologies that may be useful in controlling HAP emissions. Hence, industry and EPA need a process in which knowledge precedes regulatory action.

EPA and stakeholders have decades of experience working to reduce emissions of criteria pollutants from mobile sources. These programs have been based on a systematic rulemaking process where the pollutants to be controlled are determined, the "baseline" emission level of each pollutant fixed, and then methodologies to reduce them are identified. As the final step, emission limits are set.

Likewise there is also a good experience base for measurement and reduction of criteria pollutants emitted from stationary RICE. Although specific federal regulations do not exist, state and local air quality regulators have required progressively lower emissions from RICE. Engine manufacturers achieved these lower emissions with considerable experimentation and technology development.

In both the mobile and stationary regulatory arenas, a small number of criteria pollutants have been named and numerical limits set. The ICCR process did not have the luxury of such a pollutant "short list" on which to focus for MACT standard development. Instead, the process has a list of 188 pollutants potentially requiring regulation. To tackle the reduction of pollutants, the few

that are important need to be defined so that practical emission reduction programs can be established.

STATUS OF DEVELOPMENT OF MACT FOR EXISTING IC ENGINE SOURCES

Thus far the ICCR process in the RICE WG has focused on MACT for existing sources. The Coordinating Committee (CC) has agreed with the RICE WG's conclusion that the MACT Floor recommendation for existing RICE is, with the exception of one subcategory, "No MACT Floor." That exception is spark-ignited, natural gas fueled, 4-stroke, rich burn engines, where the database revealed that a Non-Selective Catalytic Reduction (NSCR) after-treatment system is installed in the average of the best-performing 12% of such units operating in the field.

Because comprehensive representative data do not exist for HAPs emitted from the various existing engine subcategories that have been established a test plan was formulated to support the MACT rule development.This testing program, not yet begun, is designed to address critical emissions data gaps. It will determine the levels of certain HAPs such engines emit, the effect of operating conditions on HAP emissions, and the effectiveness of existing catalyst technology in reducing HAPs for the four main subcategories. The information gained from these tests is intended to help determine the pollutants to be regulated and the levels that would be set for MACT.

MACT for existing engines will "drive" the MACT for new ones. Under the Clean Air Act, EPA must adopt as its MACT requirement for new sources standards that are as least as stringent as the best controlled existing sources.

NEW SOURCE MACT CONSIDERATIONS

There are four main issues that must be considered before EPA can adequately address new source MACT for stationary RICE.

1. Engine Subcategories

The WG believes the same ten subcategories of RICE identified in the rationale document forwarded to the EPA by the CC to establish MACT for existing sources should be carried over to new sources. These subcategories were established based on consideration of their various fuels, combustion processes, and other criteria. These fundamental differences will create the same characteristics for both existing and new

engines. The WG, therefore, concludes that the same ten (10) subcategories should be retained for new sources.

2. Which HAPs Are to be Regulated?

No assessment can be made of control methodology without knowing what needs to be controlled. Of the 188 listed HAPs to be potentially regulated, only a few, are likely to be of concern for stationary RICE. Consequently, before considering MACT for new engines, EPA needs to first identify which HAPs are produced in significant amounts by each subcategory of RICE. The testing program at Colorado State University will help determine which HAPs should be regulated.

3. Emissions Data

To properly set a MACT standard, the agency must assess the level of HAP emissions from each subcategory of new engines. Very little HAP emissions data are available from stationary RICE sources although data on criteria pollutants are substantial. The tradeoffs between individual HAPs and between criteria and HAPs emissions will also need to be addressed. Control of some HAP emissions using certain methodologies may result in increased emissions of other HAPS and/or criteria pollutants.

4. Potential Standards

After the first three issues above are resolved MACT standards can be considered. A requirement may be expressed in the following three main ways:

- As an emission limit, e.g., grams/bhp-hr or concentration
- As a percentage reduction from a baseline
- As a hardware requirement

The WG recommends that any MACT standards for new engines be expressed as an emission limit, and separately by engine subcategory and by HAP. This keeps the door open for attainment of regulated levels without the addition of specific, mandated technology.

ADVANTAGES TO A MACT STANDARD PROMULGATED AS A NUMERICAL LIMIT

Promulgating any MACT standard as a numerical limit on a specific HAP will maximize the manufacturer's and operator's flexibility to meet the requirements cost effectively and will ensure that the latest in emission control technology – whether in-cylinder, aftertreatment, or fuel modification – will be employed. Such an approach also will give those responsible for the equipment at the facility -- manufacturers, contractors, and/or operators -- the ability to choose the most appropriate method to comply with the standard. Conversely, requiring specific hardware denies operators the option of using bare engines, which could, in future, be cleaner, or alternate or newer technology.

Requiring that a specific emission control technology be installed on an engine effectively "locks in" that existing technology. Manufacturers would have little incentive to improve their engines since, regardless of combustion improvements, the specified aftertreatment device would still be required on their product. If the MACT standards require specific hardware, therefore, basic engine development for reduced HAP levels would likely stagnate. That could result in lost opportunities to develop a new and different technology that potentially reduces HAP emissions by the same amount as – or more than -- a specified aftertreatment device, but with greater robustness, efficiency, fuel economy, and/or less cost. This would be counter-productive to long range clean air objectives.

Setting any MACT standard as an emission limit, and avoiding a specific technology or specific hardware requirement, helps assure cost-effective compliance and encourages continued development of innovative control methodology.